

ACCOUNT
OF THE
EXPERIMENTS
TRIED BY THE
BOARD OF AGRICULTURE.

[PRICE ONE SHILLING.]

*R. Academies &
Lodge of St. Anthony &
London.*

ACCOUNT

EXPERIMENTAL

PRINTED BY THE



BOARD OF AGRICULTURE

PRICE ONE SHILLING

ACCOUNT

OF THE

EXPERIMENTS

TRIED BY THE

BOARD OF AGRICULTURE,

IN THE

COMPOSITION OF VARIOUS SORTS OF BREAD,

ANNO 1795.

LONDON:

PRINTED FOR G. NICOL, PALL-MALL,

BOOKSELLER TO HIS MAJESTY, AND TO THE BOARD OF AGRICULTURE;

AND SOLD BY MESSRS. ROBINSON, PATERNOSTER-RROW; J. SEWELL, CORN-
HILL; CADELL AND DAVIES, STRAND; WILLIAM CREECH, EDINBURGH;
AND JOHN ARCHER, DUBLIN.

M.DCC.XCV.

ACCOUNT

OF THE

EXPERIMENTAL

TRIAL BY THE

BOARD OF AGRICULTURE

ON THE

COMPOSITION OF VARIOUS



AND 1882

LONDON:

PRINTED FOR G. NICOL, WALL-MALL,

ROBERTSON TO HIS MAJESTY, AND TO THE BOARD OF AGRICULTURE,

AND SOLD BY MESSRS. ROBINSON, PATERNOSTER-ROW, L. LEWELL, CORN-

HILL; GARDNER AND DAVIES, STRAND; WILLIAM GREEN, EDINBURGH;

AND JOHN ARCHER, DUBLIN.

1882

INTRODUCTION.

THE BOARD of AGRICULTURE, on taking into consideration the great question of Substitutes for Wheat, in the manufacture of Bread, were desirous of making such Experiments, as the sudden exigency of the moment seemed to demand. All the sorts of grain commonly sold at London, were therefore procured, ground into meal, and baked in various mixtures into bread. The following were the species pitched upon, namely, Wheat, Rye, Rice, Barley, Buck-Wheat, Maiz, Oats, Pease, Beans, and also Potatoes.

It would have been a very interesting and important inquiry, to have attempted to ascertain by experiment, the nutritive qualities of all sorts of corn from which bread could be made, in a manner similar to the analysis of potatoes, made by Dr. PEARSON, at the request of the Board. But as such experiments demand much time, they could not have been executed soon enough, to answer the views with which the Board directed these sorts of bread to be made. Most of the sorts of grain above-named, form the principal nourishment of mankind in various countries. For, not to mention wheat, rye, and oats,* on which so many thousands,

* Mr. SMITH, in his Tracts on the Corn Trade, states, from a variety of inquiries, that the quantity of the different sorts of food consumed, is, of

			qr.	bls.
Wheat	-	-	1	0
Barley	-	-	1	3
Rye	-	-	1	1
Oats	-	-	2	7

per head, per annum.

A 2

both

both in England and Scotland, are supported, barley bread is the common nourishment in many parts of Wales, in Devonshire and Cornwall, and has been introduced with good success in various other countries; and though a novelty, is highly esteemed in the county of Rutland. Buck-Wheat, made into thin cakes, is the chief article of food in Bretagne, part of Normandy, and part of North America. Rice nourishes, probably, more human beings, than all other articles of food taken together; and, for its bulk, is supposed to be the most nutritive of all the sorts of grain. Maiz is a principal article throughout the South of Europe, and is made into bread in Italy, and in America. Pease and beans have rarely, it is believed, been used as bread; but it is suspected, enter largely, though clandestinely, into its composition, in various districts. It is hardly necessary to mention, what a valuable article of food potatoes have become, in these as well as other kingdoms.

To ascertain the respective qualities of all these grains, and to discover their operation on each other, in correcting, by means of one, the defects of another, is an inquiry that deserves great attention; and the Board cannot omit to call on individuals, to make the experiments necessary for this purpose, and to lose no opportunity of multiplying observations, which, if communicated to this Institution, shall receive proper attention, and be combined in such manner, as shall best tend to promote the public good.

STATEMENT OF THE WEIGHT, PRICE, &c.

OF THE DIFFERENT ARTICLES MADE USE OF IN THE COMPOSITION
OF BREAD, EXHIBITED BEFORE THE BOARD OF AGRICULTURE,
NOVEMBER 10, 1795.

	Price per Bushel	Total price of each.	Weight of the Grain.	Wt. per Bushel	Weight of the Flour.	Weight of the Bran.
	s. d. £.	s. d.	cwt. qr. lb.	lb.	cwt. qr. lb.	cwt. qr. lb.
Three Bushels Wheat - - -	13 0	1 19 0	1 2 8	58½	1 1 14	0 0 19
Three Bushels Barley - - -	5 6	0 16 6	1 0 26	46	1 0 4	0 0 17
Three Bushels Buck-wheat - -	6 0	0 18 0	1 0 27	46¼	1 0 9	0 0 16
Three Bushels Indian Corn - -	7 6	1 2 6	1 1 18	53	1 0 20	0 0 26
Three Bushels Rye - - -	6 6	0 19 6	1 1 22	54	1 0 17	0 1 0
Three Bushels Rice - - -	23 0	3 9 0	1 2 16	61¼	1 2 13	0 0 0
Three Bushels Oats - - -	4 0	0 12 0	1 0 3	38½	0 2 14	0 1 13
Three Bushels Beans - - -	5 6	0 16 6	1 2 5	57¾	1 0 18	0 1 8
Three Bushels Boiling-pease -	10 0	1 10 0	2 2 17	61¾	1 1 1	0 1 9
Three Bushels Potatoes - - -	2 6	0 7 6	1 2 8	58½		

The flour of each sort being thus procured, separate from the bran, the expence per pound, was next calculated, and is as under, without deducting any thing for the value of the bran; which the Board would have calculated, had they been in possession of sufficient information to have done it with accuracy; but such sorts of bran being never seen in the markets, or in common consumption in the neighbourhood of London, the idea must have been rather vague. The miller who ground them, could affix no price.

Sorts.	Price per lb. of the Flour.
	s. d.
Wheat - - -	0 3
Barley - - -	0 1½
Buck Wheat - - -	0 1½
Maiz - - -	0 2
Rye - - -	0 1½
Rice - - -	0 4½
Oats - - -	0 2
Beans - - -	0 1½

The

The pease were not of a proper degree of dryness, for grinding properly. Had that been the case, the flour would have turned out about the price of that of the beans. As it was, from the quantity of bran, it turned out much higher.

Of the several sorts of grain here detailed, the following experiments were made.

Three bushels of wheat	100
Three bushels of barley	100
Three bushels of oats	100
Three bushels of rye	100
Three bushels of corn	100
Three bushels of peas	100
Three bushels of beans	100
Three bushels of lentils	100
Three bushels of mung beans	100
Three bushels of chick peas	100
Three bushels of vicia	100

The above list of grain is given for the purpose of showing the relative value of the different sorts of grain, and the quantity of flour which can be made from each sort. It is to be observed that the value of the grain is not the same in all parts of the country, and that the quantity of flour which can be made from each sort is not the same in all parts of the country. The value of the grain is also affected by the quality of the soil, and the quantity of labour which is expended in its cultivation. The quantity of flour which can be made from each sort is also affected by the quality of the mill, and the skill of the miller. The value of the grain is also affected by the quantity of labour which is expended in its transportation. The quantity of flour which can be made from each sort is also affected by the quantity of labour which is expended in its storage.

Wheat	100
Barley	100
Oats	100
Rye	100
Corn	100
Peas	100
Beans	100
Lentils	100
Mung beans	100
Chick peas	100
Vicia	100

LIST OF THE VARIOUS SORTS OF BREAD

EXHIBITED BEFORE THE

BOARD OF AGRICULTURE,

ON 10TH NOVEMBER, 1795.

NO.

UNMIXED BREAD.

- 1 Best Wheaten Bread.
- 2 Standard Wheaten.
- 3 Household.
- 4 Barley Bread.
- 5 Oat Bread.
- 6 Rye Bread.

MIXED BREAD.

WHEAT THE BASIS.

- | | | |
|---------------------|-------------------|---------------------|
| 7 One-third wheat, | One-third rice, | One-third potatoes, |
| 8 One-third ditto, | One-third beans, | One-third ditto, |
| 9 One-third ditto, | One-third pease, | One-third ditto, |
| 10 One-third ditto, | One-third maiz, | One-third ditto, |
| 11 One-third ditto, | One-third rye, | One-third ditto, |
| 12 One-third ditto, | One-third barley, | One-third ditto, |
| 13 One-third ditto, | One-third buck, | One-third ditto, |
| 14 One-third wheat, | One-third oats, | One-third ditto, |
| 15 One-third ditto, | Two-thirds rice, | |
| 16 One-third ditto, | Two-thirds beans, | |
| 17 One-third ditto, | Two-thirds pease, | |

NO. 18

NO.

18 One-third wheat,	Two-thirds oats,
19 One-third ditto,	Two-thirds barley,
20 One-third ditto,	Two-thirds rye,
21 One-half ditto,	One-half rice,
22 One-half ditto,	One-half barley,
23 One-half ditto,	One-half rye,
24 Two-thirds ditto,	One-third rice,
25 Three-fourths ditto,	One-fourth rice,
26 Two-thirds ditto,	One-third barley.

BARLEY THE BASIS.

27 One-third barley,	One-third rice,	One-third potatoes,
28 One-third ditto,	One-third beans,	One-third ditto,
29 One-third ditto,	One-third pease,	One-third ditto,
30 One-third ditto,	One-third maiz,	One-third ditto,
31 One-third ditto,	One-third rye,	One-third ditto,
32 One-third ditto,	One-third buck,	One-third ditto,
33 One-third ditto,	One-third oats,	One-third ditto.
34 One-third ditto,	Two-thirds rice,	
35 One-third ditto,	Two-thirds beans,	
36 One-third ditto,	Two-thirds pease,	
37 One-third ditto,	Two-thirds oats,	
38 One-third ditto,	Two-thirds rye,	
39 One-half ditto,	One-half rice,	
40 One-half ditto,	One-half rye,	
41 Two-thirds ditto,	One-third rice,	
42 Three-fourths ditto,	One-fourth rice.	

OATS

OATS THE BASIS.

NO.

43 One-third oats,	One-third rice,	One-third potatoes,
44 One-third ditto,	One-third beans,	One-third ditto,
45 One-third ditto,	One-third pease,	One-third ditto,
46 One-third ditto,	One-third maiz,	One-third ditto,
47 One-third ditto,	One-third rye,	One-third ditto,
48 One-third ditto,	One-third buck,	One-third ditto.
49 One-third ditto,	Two-thirds rice,	
50 One-third ditto,	Two-thirds beans,	
51 One-third ditto,	Two-thirds pease,	
52 One-third ditto,	Two-thirds barley,	
53 One-third ditto,	Two-thirds rye,	
54 One-half ditto,	One-half rice,	
55 One-half ditto,	One-half rye,	
56 Two-thirds ditto,	One-third rice,	
57 Three-fourths ditto,	One-fourth rice,	
58 Two-thirds ditto,	One-third barley.	

RICE THE BASIS.

59 One-third rice,	One-third beans,	One-third potatoes,
60 One-third ditto,	One-third pease,	One-third ditto,
61 One-third ditto,	One-third maiz,	One-third ditto,
62 One-third ditto,	One-third rye,	One-third ditto,
63 One-third ditto,	One-third buck,	One-third ditto,
64 One-third ditto,	One-third oats,	One-third ditto.
65 One-third ditto,	Two-thirds beans,	
66 One-third ditto,	Two-thirds pease,	
67 One-third ditto,	Two-thirds oats,	
68 One-third ditto,	Two-thirds rye,	
69 One-half ditto,	One-half rye,	
70 Two-thirds ditto,	One-third barley.	

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The experiments that have been made on this root, are numerous, and the result similar. It makes a pleasant palatable bread, with wheat in the proportion of one-third, but one-fourth will lighten and better.

As all these sorts of bread were made at once, by several bakers, in order to be examined at the same time, the execution was by no means such as gave the Board satisfaction. One general result, however, was striking to many Gentlemen who tasted them, that very few, if any, of the loaves then exhibited, were too bad for human food in times of scarcity; and afterwards, when given to the poor, all of them were most thankfully received, and eaten: and here it may be observed, as a circumstance particularly deserving of attention, that the practice of a few days, will reconcile the taste and stomach to different sorts of food, which, at first, might be disagreeable; and consequently, that the failure of a few trials at first, ought not to be discouraging.

As the experiments above-mentioned were followed by others more satisfactory, it will be proper to explain, under distinct heads, the effects which have been remarked.

RICE.

Of all the mixtures, none has made bread equally good with rice, not ground, but boiled quite soft, and then mixed with wheat flour. One-third rice, and two-thirds wheat, make good bread; but one-fourth rice, makes a bread superior to any that can be eaten, better even than all of wheat; and as the gain in baking, is more than of wheat alone, and rice to be had from the East Indies in any quantity, and might be imported here, it is said, so low as one penny three farthings, or at the utmost, two-pence per pound, it appears to be an object of very great importance, more especially, as there can be no doubt of the nutritive quality. Were it imported with the husk on, of which it might be divested here much cheaper than in America, the Carolina rice might be had, it is supposed, much lower than at present.

POTATOES.

The experiments that have been made on this root, are numerous, and the result similar. It makes a pleasant, palatable bread, with wheat in the proportion of one-third, but one-fourth still lighter and better.

Specimens

Specimens of barley and potatoes, and also of oats and the same root, made into bread, have been sent to the Board, which promise well. In some cases, the potatoe was not boiled, but merely grated down into a pulp, and mixed with wheaten flour, in which mode it made excellent bread. Potatoes seem to have an admirable effect, in making any species of bread naturally harsh or heavy, light and pleasant.

OATS.

This grain is so well known in various parts of the kingdom, that the proper mode of using it, is perfectly well ascertained. It appears, from Dr. PEARSON, of Birmingham's experiments, (Appendix, No. II.) that it answers better, mixed with potatoes, than was commonly apprehended.

BARLEY.

The Board has had no barley bread before them, that does not feel heavier in the hand than wheaten; but this is no proof against its nutritive quality: mixed with wheat, half and half, or potatoes one-fourth and three-fourths barley, the bread is good. Its great plenty in the present year, renders it an object highly promising*.

* The following receipt, for making bread of wheat and barley flour, has been strongly recommended to the attention of the Board:

To four bushels of wheat, ground to one sort of flour, extracting only a very small quantity of the coarser bran, add three bushels and a half of barley flour, bolted through a twelve or fourteen shillings cloth. The oven should be hotter than when bread is made of wheat alone, and the loaves should remain in the oven three hours and a quarter. The offal of the barley is good food for hogs. This bread appears to be improved, by being baked in half-gallon loaves. Even at the high price of wheat and barley in November 1795, this bread could be afforded at seventeen-pence the gallon loaf.

RYE.

In several parts of the kingdom, a mixture of rye and wheat, is reckoned an excellent species of bread. In Nottinghamshire, opulent farmers consume one-third wheat, one-third rye, and one-third barley; but their labourers do not relish it, and have lost their *rye teeth*, as they express it. As rye is well known to be a wholesome and nutritious grain, its consumption cannot be too strongly recommended.

The following mode of making a new kind of household bread, on a long trial, has been found to answer extremely well. Supposing a bushel of rye to weigh 60 lb. to that add one-fourth part, or 15 lb. of rice. This is all ground down together, and taking out the broad brap only, which seldom exceeds four and a half, or five pounds, for that quantity, it is thus prepared for household use. Fourteen pounds of this flour, when baked into bread, and well soaked in the oven, will produce twenty-two pounds weight of bread, which is a surplus of three pounds and a half in fourteen pounds, over and above what is usually produced in the common process of converting household wheat flour into bread. The astringent quality of the rice, thus mixed with rye, corrects the laxative quality of the latter, and makes it equally strong and nourishing with the same weight of common wheaten bread.

INDIAN CORN.

The flour of Indian corn, by itself, makes a heavy bread, in all the specimens yet produced to the Board. ANTHONY SONGA, Esq. the Imperial Consul, produced some wholly of this grain, which was sweet and palatable, but crumbling. He informed the Board, that the right mode of manufacturing it is, to boil the flour to the consistency

of

of paste, and then, when mixed with wheat flour, it makes excellent bread. The same idea had occurred to the Board, and was found to answer. If used by itself, it is said to have at first a laxative effect; but that diminishes by use, and at any rate, can easily be corrected, by a mixture either of barley or rice.

BUCK-WHEAT.

The following account of the mode of using this species of grain, in Brittany, was communicated to the Board by an intelligent Emigrant from that province.

No more is sent to the mill, than what is wanted for a fortnight, or three weeks at farthest.

The miller is careful only to grind, in the first instance, so as to separate the meal and the bran from the black, hard, and triangular husk, without totally grinding it down. For this purpose, the grain being first dried, if necessary, on a kiln, he places the stone in such a manner as only to press lightly. This first process being over, the miller proceeds the same as with any other grain.

The mode of preparing the dough, is simple. The meal is steeped by slow degrees, and worked up for two or three hours, before it is made into cakes.

Respecting the pap, they boil water in a vessel; this water is drawn off, boiling hot, into another vessel, where it is taken to steep the flour over the fire. This operation is done slowly, and the pap, brought to the consistence required, soon becomes sufficiently prepared; but before this is completed, a little salt is added.

The

The process is the same, when, instead of salt and water, sugar and milk are preferred. The best pans or kettles, are iron ones, which metal is the best for the stoves in which the cakes are baked*.

As considerable quantities of buck-wheat might be procured, if necessary, from various quarters of the globe, as Russia, America, the Mediterranean, &c. it was thought proper to mention in this sketch, what has been found the most advantageous mode of consuming it, in a province where it is much used, and is justly accounted one of the most valuable of its productions.

BEANS AND PEASE.

The Board have been informed, when these are used as bread, that in some places, the meal, or flour, is steeped in water, to take off the harsh flavour, and that afterwards, when mixed with wheat flour, the taste is hardly to be perceived. Specimens of very good bread, have been produced, mixed as follows: 1 lb. bean flour, 1 lb. potatoes, and 4 lb. flour.

* "Nothing is lost with buck-wheat.—The black and triangular husk serves, under the stove as fuel for the cakes; the bran is good for domestic animals, particularly hogs. Even the leaves, when green, are eaten like spinnage, and in preference by some people. I have proofs of the efficacy of this leaf, as well as of buck-wheat itself. In 1768, my father was reduced to the lowest state, by a pulmonic disorder; the physician, after having tried every other remedy, prescribed a regimen of buck-wheat leaves, and a light cake made of its flour. My father having followed this course during six months, enjoyed (at the period of my deportation from France), a good state of health, at the age of seventy-two, and such as seemed durable, if the chagreen of seeing all his sons banished, or guillotined, has not shortened his days. My eldest brother, who is a physician, has often assured me, that my father owed his recovery entirely to this regimen of buck-wheat." PAPER BY M. —.

The

The flour, or meal, both of beans and pease, by being boiled previous to its being mixed with wheaten flour, incorporates more easily with that article, and probably is much wholesomer than otherwise it would be.

CONCLUSION.

The pressure of the present exigency, renders it necessary to lay these hints, however imperfect, before the public. To complete them in the manner that would be so desirable, would require no inconsiderable degree of uninterrupted attention, for some space of time, and perhaps with more advantages than the Board of Agriculture possesses. Millers, mealmen, and bakers, are naturally averse to experiments, which put them out of their usual course, and give them a great deal of additional trouble; and unless the experiments are tried under the inspection of such a body as the Victualling Board, who have millers, bakers, &c. more immediately under their command, it will be extremely difficult to have such a set of experiments gone through, as will be completely satisfactory.

APPENDIX.

The food, or milk, both of beans and peas, by being boiled previous to the being mixed with which from, incorporates more easily with the water, and probably is much whiter than otherwise it would be.

CONCLUSION.

The results of the present Agency, renders it necessary to lay these facts, however imperfect, before the public. To complete them in the manner that would be so desirable, would require no inconsiderable degree of uninterrupted attention, for some spots of time and persons with more advanced than the Board of Agriculture possess. Military men, men, and having an naturally avers to experiments, which put them out of their usual course, and give them a great deal of additional trouble; and unless the experiments are tried under the inspection of such a body as the War Office, Board, who have military, sailors, &c. more immediately under their command, it will be extremely difficult to have such a set of experiments gone through as will be completely satisfactory.

APPENDIX.

COMMUNICATIONS TO THE BOARD, ON SUBSTITUTES FOR WHEAT.

NUMBER I.

EXTRACTS FROM SMITH'S TRACTS ON THE CORN TRADE, AND CORN LAWS,
2D EDIT. PRINTED ANNO 1766; TENDING TO PROVE THE GREAT CON-
SUMPTION OF BARLEY, RYE, AND OATS, 30 YEARS AGO, IN ENGLAND.

IN this very valuable work, there is much information, which, though more appli-
cable to the times in which it was written than to the present, yet throws no inconsi-
derable degree of light upon the subject of corn in general. We shall first give Mr.
SMITH's account of the growth and consumption of England alone, as stated by him in
a paper written, anno 1765.

General Account of the Corn Grown, Consumed, &c. in England.

	Growth.	Consumed.	Export.	Import.
Barley - - -	4,603,272	4,433,125	171,253	1,106
Oats - - -	4,240,947	4,252,725	3,737	15,515
Rye - - -	1,063,652	1,030,000	36,591	2,939
Wheat - - -	4,046,603	3,840,000	210,771	4,168
	<u>13,954,474</u>			
Seed one-tenth -	<u>1,395,447</u>			
	<u>15,349,921</u>	<u>13,555,850</u>	<u>422,352</u>	<u>23,728</u>

On the supposition that there were six millions of people in England, Mr. SMITH
calculated that they consumed the different kinds of grains used in the composition of
bread, in the following manner :

Number of Persons.	Consumption of each in bread.	Total of quarters:
	qr. b.	
3,750,000	Wheat - 1 0	3,750,000
739,000	Barley - 1 3	1,016,125
888,000	Rye - 1 1	999,000
623,000	Oats - 2 7	1,791,225

The greater quantity of barley and oats, compared to wheat and rye, consumed in
bread, is owing to the larger proportion there is in those grains, of husk or bran.

From the above accounts, drawn up by a person of great knowledge and attention
in inquiries of that nature, it is evident, that much greater quantities of barley, rye
and oats, were consumed thirty years ago, than at present. No less than 2,250,000 of
the inhabitants of England were supposed to subsist on those articles ; and if nearly in
the same proportion, they could be prevailed upon to adopt the same practice now, there
is certainly at present a sufficient quantity of grain from the last crop, of the various
sorts grown in the island, to prevent the smallest risk of scarcity this year.

NUM-

NUMBER II.

COMMUNICATIONS FROM DR. PEARSON, AT BIRMINGHAM.

SIR,

UNDERSTANDING that the Board of Agriculture is, at this time, engaged in trying the effects of different vegetable productions when made into bread, in order to lessen the consumption, and lower the price of wheat, I take the liberty of mentioning, that I have found a mixture of oat-meal, flour, and potatoe-meal, to answer this purpose remarkably well.

I take equal parts of oat-meal and flour, and one-fourth part of the whole of potatoe-meal, which, with a proper quantity of yeast, and milk and water (or decoction of the offal parts of butchers' meat, or of fresh bones, rasped or pounded), are made into a dough in the usual manner, and baked. The bread thus prepared, rises well in the oven, is of a light brown colour, and by no means unpleasant flavour, tasting so little of the oat-meal, as to be taken by those who are unacquainted with its composition, for barley or rye bread. It is sufficiently moist, and if put in a proper place, keeps well for a week. How much cheaper it is than household wheaten bread, is seen by the following comparative statement :

Price of a half-peck loaf of oaten bread.		Price of a half-peck loaf of household wheaten bread.	
Three pints of oat-meal, at 2s. 4d. per peck	s. d. 0 5½	Half a peck of seconds wheat-flour, at 3s. 4d. per peck	s. d. 1 8
Three pints of flour (seconds), at 3s. 4d. per peck	0 7½	Yeast and salt	0 1½
One quart of potatoe-meal, from three full* pints of potatoes, at 8d. per peck	0 1½	Total cost	1 9½
Three-fourths of a pint of milk (to be mixed with about an equal quantity of water), at 2d. per pint	0 1½	Difference in favour of oaten bread	0 4½
Yeast and salt	0 1½		
Total cost	1 5½		

In this estimate, the different articles are rated at the prices they now bear in this town, where some of them are cheaper, and others dearer, than they are in the metropolis. To adapt the calculation to the London market, we will suppose the ingredients in the oaten bread to be under-rated one penny, or one penny and a farthing : yet even then, the difference of expence in favour of that bread will be three-pence in every half-peck loaf, which in large families will, at the year's end, amount to a very considerable

* By a full pint, is meant a pint not barely full, but with three or four potatoes piled upon it. The smaller roots, when measured in this way, generally yield about two-thirds their bulk of meal.

derable saving. But, what is the main object, if such bread were brought into general use, there would be a saving of five-eighths of the flour that is at present consumed. It would not be difficult to calculate, how many bushels less of wheat would thus suffice in every family, and how many thousands less of quarters would be required throughout the kingdom.

In reflecting on the means of lessening the consumption of wheat, by the substitution of other grain, it has appeared to me, that, next to Indian corn, none are likely to answer so well as oats. For making bread, with other admixtures, I prefer oats to either barley or rye; for barley-meal gives a heavy, viscid, and flatulent bread; and bread that contains a large proportion of rye-flour, readily becomes acescent, and consequently very unfit for children, and frequently disagrees even with grown-up persons; whereas the wholesome qualities of oat-meal, and its fitness as an aliment for man, are proved in the most satisfactory manner, by the healthiness and vigour of the inhabitants of the northern part of Great Britain, to whom it is the principal food, both in the infant and adult state. In addition to the objections already thrown out against barley and rye, it may be mentioned, that they are considerably dearer than oats, which, at the time that a cheap provision for the poor is required, is a matter of no small moment. Under every point of view, therefore, oats seem to be preferable to the other species of grain, as a general substitute for wheat.

It is painful to reflect, that in the midland and southern parts of England, oats, which are so well suited to afford sustenance to man, should hitherto have been almost exclusively applied to the maintenance of horses. Under the present circumstances, it is to be hoped, that the higher orders of society, and all others who keep horses, will introduce into their stables a mixture of beans and bran, pease and bran, carrots, &c. in place of oats. The general use of such substitutes in private and public stables, and more especially in the army, could not fail to lower the price of oats very considerably, and thereby secure to the labouring poor, an abundance of cheap and wholesome sustenance.

As oat-meal is destitute of the glutinous principle which is contained in wheat-flour, it is necessary to supply this deficiency, when it is made into bread, by means of milk, or decoctions of animal substances; which is the reason why they are set down in the preceding receipt, instead of water alone.

I have the Honour to be, most respectfully,

SIR,

Your obedient humble Servant,

RICHARD PEARSON, M. D.

Physician to the General Hospital, near Birmingham.

To Sir JOHN SINCLAIR, Bart.
President of the Board of
Agriculture.

Birmingham, November 30, 1795.

SIR,

In answer to your letter, which I had the honour to receive yesterday, I have to observe, that by potatoe-meal, mentioned in my receipt for making oaten-bread, I do not mean the proper farina, separated from all the other constituent parts of the root, and exhibited in a dry state, but the whole internal substance of the root, freed from the peel, and deprived of part of its water by boiling. Instead of *potatoe-meal*, it would have been more accurate to have called it *potatoe-pulp*, a term which (to prevent misapprehension), I shall hereafter employ. Of this pulp, I obtain two pints from three pints of the roots.

I have the Honour to be, most respectfully,

SIR,

Your obedient humble Servant,

RICHARD PEARSON.

To Sir JOHN SINCLAIR, Bart.
President of the Board of
Agriculture.

Birmingham, December 4, 1795.

SIR,

AGREEABLY to your desire, I have this day sent a half-peck loaf of my oaten-bread, for the inspection of the Board.* I expect it will be delivered at your house to-morrow. As it was baked this morning, I think it should be kept a day or two before it is cut.

The ingredients of which this loaf is composed, are of the same kind, and in the same proportions, as mentioned in the first letter which I had the honour to address to you on this subject, viz. three pints (dry measure) of fine oat-meal, three pints of seconds flour, and one quart of potatoe-pulp, kneaded into a dough with a proper quantity of yeast, salt, and milk and water. The following is an exact statement of the cost of the several ingredients, contrasted with the expence of an equal quantity (by measure) of flour made into bread.

Value of a half-peck loaf of oaten bread.			Value of a half-peck loaf of wheaten bread.		
Three pints of oat-meal, at 2s. 4d.	s.	d.	Half a peck of seconds flour, at	s.	d.
per peck	0	5½	3s. 8d. per peck	1	10
Three pints of flour, at 3s. 8d. per			Yeast and salt	0	1
peck	0	8½			
One quart of potatoe-pulp from			Total cost of this loaf	1	11
three pints of potatoes, at 8d. per			Ditto of oaten loaf	1	5½
peck	0	1½			
Three-fourths of a pint of milk (to			Difference in favour of oaten bread	0	5½
be mixed with half † a pint of					
water), at 2d. per pint	0	1½			
Yeast and salt	0	1			
Total cost	1	5½			

* The bread was of excellent quality.

† At first, I used an equal quantity of water; but I now employ only two-thirds of that quantity. In this respect there will be always a variation, according as the potatoe-pulp is more or less moist.

You

You will immediately perceive, Sir, that the prices of some of the articles are higher in this estimate than they were in my former one : in our market, the prices of flour and meal vary almost every week. Within this last month, seconds flour have been at 3s. 4d. 3s. 6d. and 3s. 8d. per peck. - That which I first used, and which I had by me some time, cost only 3s. 4d.; and there is now a mixed sort sold at some of the shops for 3s. 6d.; but for the best seconds, I have paid at the rate of 3s. 8d. The value of yeast is likewise very variable, viz. from 4d. to 10d. per quart. Of this, less than half a pint was used in this loaf, and an ounce and an half of salt (a cheap commodity in this place, on account of our vicinity to the salt springs of Droitwich), both which ingredients together, I estimate at one penny.

The dough weighed seven pounds and an half; after it was baked it weighed only six pounds and an half; so that the loss in the baking amounted to one pound.

The dough stood two hours, to ferment or rise; and remained in the oven three hours.

I shall be happy, if my experiments and observations on this subject, shall in any degree tend to promote the patriotic designs of the Board; and have the honour to be, most respectfully,

SIR, your humble Servant,

RICHARD PEARSON.

To Sir JOHN SINCLAIR, Bart.
President of the Board of
Agriculture.

NUMBER III.

INFORMATION COMMUNICATED BY DR. PENNINGTON.

VARIOUS experiments have been made, to combine the meal of wheat, barley, oat, bean, and pea-flour, with vegetable substances, and which have been found to produce very wholesome and nutritive bread.

Potatoes mixed with any of these substances, have been prepared in the following manner:

Take potatoes pared, and scraped or grated down, fourteen pounds, put them into an earthen or wooden vessel, and pour upon them two gallons of pure water; let the mixture stand about three hours; on pouring it off, it will be found very thick, and with an earthy taste; pour on fresh water as before, changing it every three hours, till it becomes nearly clear and insipid, which it will be in from twenty-four to thirty-six hours, though forty-eight hours are required to produce the whitest pulp. This pulp appears to consist of two parts, viz. the white-meal, which settles at the bottom, and of which starch, &c. may be made, and the upper part, which appears of a fibrous quality. Previous to the mixture of this pulp of potatoes with flour, the water should be pretty well drained from it, taking care that as little as possible of the mealy and fibrous part of the potatoe escapes with the water. The fourteen pounds of scraped or grated potatoe, thus purified from its earthy quality, weigh only seven pounds; this is to be mixed with fourteen pounds of the flour of wheat or barley; the yeast is then put in, and

and a small quantity of warm water (milk is better); the dough well worked up in the usual manner, to be set before the fire covered up, till it rises, and then to be made into loaves to bake, and which, when returned from the oven, will produce thirty-six pounds of good bread.

A peck of potatoes weighs twenty-two pounds; the paring and taking off any bruised or defective parts, reduces it to fourteen pounds; the peck of potatoes costs here (Nottingham), five-pence.

A bushel of wheat, ground down into flour, from which three pounds of bran is dressed out, produces fifty-nine pounds of flour, which is now selling at 2s. 8d. the stone—thus :

Fourteen pounds of flour	-	-	-	2s.	8d.
Fourteen pounds of potatoes	-	-	-	Os.	5d.
Salt, yeast, and baking	-	-	-	0.	3d.

3s. 4d.

make a loaf of bread, which, when baked, weighs thirty-six pounds twelve ounces, or 1½d. per pound.

The barley loaf is still cheaper, barley-flour being only twenty-pence the stone—thus :

Fourteen pounds of barley-flour	-	-	-	1s.	8d.
Fourteen pounds of potatoes	-	-	-	Os.	5d.
Salt, yeast, and baking	-	-	-	Os.	3d.

2s. 4d.

These make a loaf, which, when baked, weighs twenty-eight pounds, or one penny per pound.

The wheaten loaves sent as specimen, are marked No. 1.—The barley No. 2.

ADDITIONAL COMMUNICATION FROM DR. PENNINGTON.

Loaf marked No. I. is from barley, wheat, and potatoes, of Wheat, barley, and potatoes not pared. { each equal parts. The wheat was undressed, *no* bran having been taken out; and the potatoes were grated down *without* paring.

Barley, and potatoes not pared. { Loaf marked II. is from equal parts of barley, and potatoes grated and purified by three washings, but not pared.

Wheat, barley, and potatoes pared. { Loaf B. W. III. is from one pound of barley, one pound of wheat, and one pound three ounces of potatoes, pared and purified.

Barley, and potatoes pared. { Loaf B. IV. is from two pounds of barley, and one pound three ounces of potatoes, pared and purified.

Wheat, and potatoes pared. { Loaf W. V. is from equal parts of *undressed* wheat, and potatoes, *pared* and purified.

This

This last is thought very good bread, and such as any family would be well satisfied with.

The barley-flour used, is what is considered only half-dressed; or three stones and an half, or forty-nine pounds of shorts or bran taken out of a quarter of eight strike, which weighed thirty stones, of fourteen pounds each.

The bread from wheat-flour undressed, and barley-flour as above noted, is still cheaper than the bread, the process of making, and the price, I some time since had the honour to submit to the Board; though in the interim, wheat has got up in the Nottingham market, from four to five shillings per quarter.

NUMBER IV.

ON BARLEY AND WHEATEN BREAD.

COMMUNICATED FROM THE PARISH OF HIGHWORTH, WILTSHIRE.

IN obedience to your request, I shall point out the reasons which led me to introduce the mixing of barley-flour with wheat-flour. Having been for several months concerned in getting bread made for the poor of Highworth, the best method I thought to proceed in, was to get the wheat ground into one sort of flour. I found by experience and observation, it produced the largest quantity of flour by grinding it down at once, and leaving only the bran, which I am convinced was the only thing to be done at that time. The harvest being so very fine, I determined, as soon as I could get it, to buy a load of barley, sent it to a mill, where I went myself, and saw the process of grinding, and then the dressing it, and by getting it dressed through different cloths, until I found it made the flour as fine, that I thought it would answer by mixing it with a certain quantity of that flour which was made from the whole produce of the wheat. I then, for trial, mixed four bushels of the wheat-flour with three bushels and an half of barley-flour, fifty-six pounds to each bushel: when baked, I found the quantity of the bread sufficiently good to offer it to the poor, with the consent of the parish, at thirteen-pence per loaf, weighing nine pounds, which caused a loss to the parish of four-pence per loaf, the said loaf costing the parish seventeen-pence; but when I considered the bread of second flour, sold by the bakers here at one shilling and ten-pence per loaf, I saw the parish gained five-pence per loaf, by its costing them only seventeen-pence, by their selling it at thirteen-pence per loaf; and when I considered what a saving of the small wheat stock it would cause among the labouring poor in the towns and villages in the country, I had a demonstrative proof, in my own mind, that no grain, the produce of this Island, would bear any proportion of saving to barley. As to mixing with potatoes, I think it an idle imagination; it may divert the whim of some, in mixing it in small quantities, but cannot have that nutriment as barley, which is looked on as the next in quality to wheat. As to rye, it has that moist quality in its nature, which cannot

cannot be drawn out of loaves by baking. I can assure you, the poor of this large parish are perfectly satisfied with this kind of bread.

Respecting the quantity of flour out of every five quarters of barley, that must depend on the quality of the barley; five quarters will produce twenty bushels, of fifty-six pounds each, and from twenty to twenty-six bushels, seldom more, of flour fit to mix with wheat-flour. The offal of the barley, when the flour is drawn from it, is to be sold for feeding hogs, the value of it, according to the quantity of flour taken from it, as the more flour is taken out, consequently the less value by the hundred is the offal. It is generally believed, as far as I can learn, that the barley-flour was never better than the present year's crop. When I went to the work-house, the small loaves were all gone. As to baking, something more is required than if all wheat, and the oven hotter, and to stand three hours and a quarter before drawn out of the oven. The value I put on the barley-flour, on an average, is seven shillings for every fifty-six pounds weight.

There were afterwards sent to the Board, two loaves baked in the house of industry at Highworth; one weighing four pounds six ounces, the other four pounds five ounces. The poor belonging to that large parish, are supplied with bread at sixpence per loaf, the weight of one of these. The oven in the house, bakes eight bushels of flour at a time, four bushels of which is wheat flour, made from the produce of wheat ground and dressed into one sort of flour, the bran only excepted: the other four bushels is barley-flour, ground and dressed as follows: forty bushels of good barley, nine gallons to the bushel, produces twenty bushels of good flour, of fifty-six pounds per bushel. It is the general opinion here, that no grain, the produce of this land, will save the wheat like barley, it being considered the next in quantity to wheat. The poor are perfectly satisfied and happy with the bread.

NUMBER V.

ON THE MEAL OF POTATOES, &c.

COMMUNICATED BY MR. SKINNER, NAVY SURGEON.

THE fibrous matter and starch of the potatoe, in the proportions in which they are obtained, constitute the true meal of that vegetable. In its perfectly organized state, it possesses a species of acrid quality, which resides in the juice; but that quality, which it possesses when raw, is not merely corrected, but expelled, by the process of boiling, as it also is by that of roasting. It would indeed appear, that the greatest advantages would result from the two processes combined. This amelioration depending, in the process of boiling, on a sufficient quantity of water being employed, the usage of boiling, as it is called, *potatoes in steam*, cannot be so much recommended.

In the preparation of the meal, in the mode which will hereafter be described, it is by no means necessary to reject the skin of the potatoe, which is both wholesome and nourishing.

Bran,

Bran, boiled in water, gives out in the first instance, a certain portion of soluble mucilage, and afterwards, by a powerful expression, a gluten, in the proportion of thirty-six parts to an hundred of the bran. This fact may shew, that animals fed in the usual way with bran, do not receive all the nourishment it contains, for neither the action, the heat, nor the gastric juice of the stomach of these animals, can operate sufficiently on the gluten.

The gluten and soluble mucilage of bran, having been brought by evaporation into a gelatinous form, it is conceived that a certain proportion of this jelly, mixed with the potatoe-meal, will assimilate the latter to, and give it all the qualities of wheaten-meal; and it can scarcely be doubted, but that, fermented with yeast or leaven, in the usual way, it can thus be formed into bread. Supposing, which is extremely probable, that the viscid tenacious gluten of wheat, may be imitated by a mixture of the gluten of the bran of wheat and the fibrous matter of the potatoe, the assimilation will then be perfect, for in wheat are contained the viscid gluten, a mucilage (this is found in the bran), and starch.

To procure the meal, the common expedients of grating, rasping, or detaching in some other mode the starch from the fibres of the root, present themselves. Perhaps, one of the best and most expeditious methods would be, to cover with wool-cards a wooden cylinder, to be worked in a simple and convenient machine, which will at once wash and separate the fibrous matter and starch. The former of these should afterwards be dried and ground into meal; the latter simply dried; and the mixture of the two finally made. With one of these carded cylinders, twelve hundred pounds of potatoes may be grated in a day, by the labour of a boy; with twelve of them, in a machine of a suitable size, more than seven tons by the labour of a horse.

Estimating the potatoes at the price at which they are now obtainable in many parts of England and Ireland, the meal, making the fullest allowance for the labour and necessary expences, may be procured at twelve or fourteen shillings the hundred weight, a price which would make a great saving indeed, supposing it either to be mixed with wheaten-meal, or made into bread by the above plan. It is not necessary here to state, to how many useful purposes it may be applied for the table. There is every reason to presume, that it will keep as well as other meal; and it will occupy about a seventh part only of the bulk of the potatoes from which it is procured—an important consideration, in the case of transportation from parts where there are abundantly more of the roots than the population demands. It may be hazarded, as a conjecture, that the quantity of potatoes spoiled by frost, &c. amounts to one-sixth, perhaps even to one-fifth of the whole growth.

The writer of this article thinks, that he could demonstrate, by very satisfactory arguments, that the whole nourishment can alone reside in the above mixture of the fibrous matter, and the starch of the potatoe, and is not to be had in their simple and unblended state.

The following articles were transmitted by Mr. SKINNER, to the Board of Agriculture:

1. Vegetable gluten, thirty-six parts of which were extracted from an hundred parts of bran.
2. Fibrous

2. Fibrous matter, from potatoes simply dried.
3. The same reduced to powder.
4. The starch of the potatoe well washed, and dried by a gentle heat, on an absorbing stone.
5. The fibrous matter, and the starch, mixed in the proportions in which they were found in the root. This appears to be the true meal of the potatoe, and with the vegetable gluten, will, he thinks, make excellent bread.

NUMBER VI.

ON THE USE OF BISCUIT.

A very effectual means of preventing any distress from the present scarcity of wheat, would be, to increase the consumption of biscuit instead of bread. In a letter from a very intelligent Gentleman in Wales, there is the following paragraph: "I have found such advantage from the use of biscuit, in preference to the common household bread, that my mind is impressed with the belief, that it ought to be much more generally used than it is at present. Wheat-flour in biscuit, will bear mixture with the flour of barley, oats, beans, pulse, &c. one pound of which certainly goes as far as two of household bread. My family, and many others, now eat it, and are better fed with it than any other we can get. I am of opinion, there would be great propriety and saving by using it in the land-service, as in the naval. First, the cost would be less, the supply more certain, less waste, and better bread than can be expected from bakers' ovens following camps and armies." A general agreement to that effect, would have prevented the necessity of any importation; as mixtures of different grains answer admirably in biscuit. It may be proper to observe, that donations had much better be given in the shape of biscuit than of bread, as in the former state, it will keep better, and will induce the people to take with their biscuit, soup, broth, or milk which, with biscuit, may be made into a wholesome and nourishing mess.

NUMBER VII.

HINTS AS TO THE MODE OF USING INDIAN CORN AND BUCK-WHEAT IN AMERICA.

It is stated on very respectable authority, as the *general* opinion of the inhabitants of the United States, but more particularly of the people of Virginia, Maryland, Delaware, and Kentucky, where Indian corn is raised in the greatest quantity, and applied to the greatest variety of uses, that *rather more* substantial nutriment is contained in a bushel

bushel of Indian corn, than of wheat. In the four States above-mentioned, it constitutes the almost entire food of the *labouring* class of the people, and has supplanted the use of wheaten bread.

There are several sorts of Indian corn in America: *the yellow flinty corn* is reckoned the sweetest and most nutritive. The *white-ground corn* of the Southern States, makes the fairest, but considerably the weakest flour. Of this last species, there is one variety called the *flour corn*, which is scarce, but very valuable.

The following is accounted the best mode of making bread of a mixture of Indian corn and flour:

Let a given quantity of water be set over the fire, and when it boils, let the Indian meal be mixed with it, little by little, and constantly stirred, so as to prevent any lumps being formed, till by the injection of the meal, a thick batter is made, like that of Scotch or Yorkshire pottage. This should boil over the fire for an hour, or an hour and an half, a small quantity of salt being previously thrown in. The wheaten-flour in the meantime should be mixed with yeast, rather more than the usual proportion, in consequence of the mixture of the Indian meal. The batter now should be taken off the fire, and when cooled to the degree of blood heat, should be poured into the dough trough with the wheaten-flour and yeast. Having been made up into loaves, and properly kneaded, it should be suffered to continue longer in the oven than wheaten loaves. Bread thus made, can be safely recommended, as certainly, at least, not less nutritious, and perhaps more palatable, when properly baked, than any other. In the shape of puddings and dumplings, this meal can be used to great advantage.

In regard to buck-wheat, it is not *kiln*, but *sun* dried, being reaped in October, a month remarkably dry and serene in America. The husk is taken off by what is called *running it through* the mill-stones. The farinaceous part of the grain, is then easily separated from the husk, by winnowing, and being then ground fine, forms an agreeable, and nutritive aliment.

NUMBER VIII.

COMMUNICATION RELATIVE TO RYE, AND FINE WHEATEN BREAD.

THE celebrated HOFFMAN, speaking of a malignant epidemic which prevailed in Germany, states, that the inhabitants of Westphalia were entirely exempted from its attacks. He ascribes their security to the circumstance of their eating rye bread; and so well assured was he of the antiseptic quality of this food, that in the above malignant epidemic, he ordered rye gruel for his patients. The success of this diluent, answered every expectation he had formed of it. The cooling and relaxing qualities of rye, make it highly probable, that a mixture of rye with wheaten meal, would obviate, in weak stomachs, the complaints that have been sometimes made against the latter, namely, that not being easy of digestion, it is apt to load the stomach and bowels with crudities, and to occasion worms. It is said, that labourers in the country, who live entirely on *fine wheaten bread*, are apt to have those complaints. Such bread, therefore, is not so essential to them as is commonly imagined, at least it has, with its advantages, its defects.

NUMBER IX.

ON THE PREPARING OF POTATOES, SO AS TO BE EAT AS BREAD.

[WITH AN ENGRAVING OF A POTATOE ROASTER.]

THERE is nothing that would tend more to promote the consumption of potatoes, than to have the proper mode of preparing them as food, generally known. In London, this is little attended to, whereas in Lancashire and Ireland, the boiling of potatoes is brought to very great perfection indeed. When prepared in the following manner, if the quality of the root is good, they may be eat as bread, a practice not unusual in Ireland.

The potatoes should be, as much as possible, of the same size, and the large and small ones boiled separately.

They must be washed clean, and without paring or scraping, put in a pot with cold water, not sufficient to cover them, as they will produce themselves, before they boil, a considerable quantity of fluid. They do not admit being put into a vessel of boiling water, like greens, and whenever they are boiled, should be taken out of the water, and kept dry.

If the potatoes are tolerably large, it will be necessary, as soon as they begin to boil, to throw in some cold water, and occasionally to repeat it, till the potatoes are boiled to the heart (which will take from half an hour, to an hour and a quarter, or even more according to their size), they will otherwise crack, and burst to pieces on the outside, whilst the inside will be nearly in a crude state, and consequently very unpalatable and unwholesome.

During the boiling, throwing in a little salt occasionally, is found a great improvement, and it is certain that the slower they are cooked, the better.

When boiled, pour off the water, and evaporate the moisture, by replacing the vessel in which the potatoes were boiled, once more over the fire. This makes them remarkably dry and mealy, more especially if they are kept for some time after in a *Potatoe Roaster*, an engraving of which is annexed.

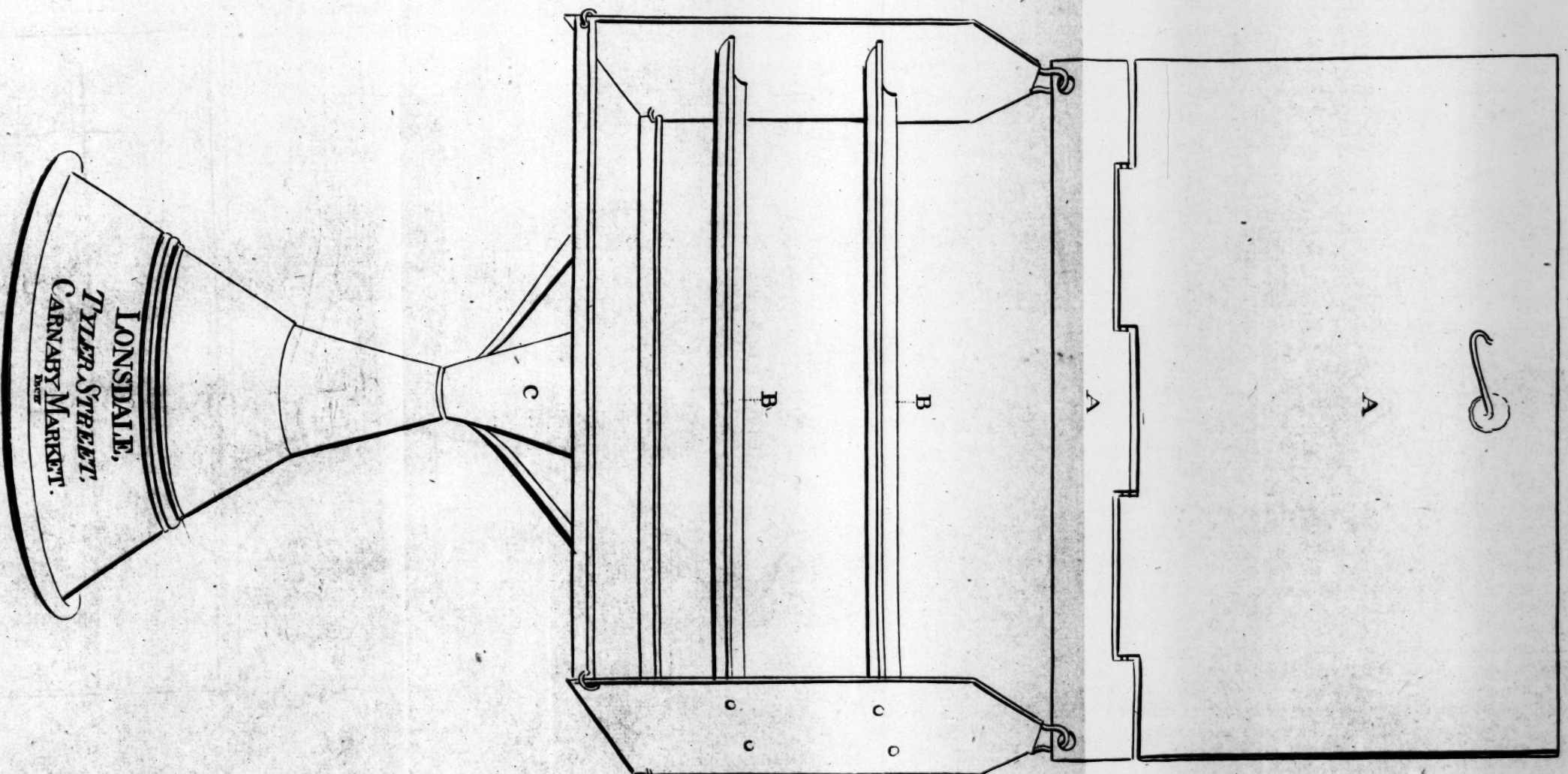
They should be brought to the table with the skins on, and eat with a little salt, as bread.

Nothing but experience can satisfy any one, how superior the potatoe is, thus prepared, if the sort is good and mealy. Some prefer roasting potatoes, but the mode above detailed, extracted partly from the interesting paper of SAMUEL HAYES, Esq. of Avondale, in Ireland, (Report on the Culture of Potatoes, p. 103), and partly from the Lancashire re-printed Report (p. 63), and other communications to the Board, is at least equal, if not superior. Perhaps uniting the two modes, or roasting them for some time after they have been thoroughly boiled, is still preferable; for which purpose the machine above-mentioned, called the *Potatoe Roaster*, is admirably calculated. Some have tried boiling potatoes in steam, thinking, by that process, that they must imbibe less water. But immersion in water causes the discharge of a certain substance, which the steam alone is incapable of doing, and by retaining which, the flavour of the root is injured, and they afterwards become dry by being put over the fire a second time, without water. Sometimes the potatoes are squeezed in a cloth, before they are put into the Roaster, to extract all the liquid, which makes them particularly mealy.

With a little butter, or milk, or fish, they make an excellent mess.

NUM-

FOR ROASTING POTATOES.



A, turns down on other side, as a screen. — B, hollowed shelves for Potatoes. — C, this part turns round on Peg or Pivot. — bottom solid. —

LONSDALE,
TYLER, STREET,
CANNABY MARKET.
DUBLIN

NUMBER X.

ACCOUNT OF THE EXPERIMENTS TRIED BY J. BISHTON, ESQ. OF KILSALL,
IN SHROPSHIRE; COMMUNICATED TO THE BOARD BY SIR WILLIAM
PULTENEY, BART.

Kilsall, November 16, 1795.

SIR,

I have taken the liberty to send by the Shrewsbury mail this morning, a loaf of bread, being part of a baking which Mrs. BISHTON has particularly attended to in person, after a confidential servant had witnessed the grinding the wheat on the rye-mill; the particulars of which are herein inclosed; and it is a proof against what has, by several, been confidently asserted, namely, that potatoes do not increase the quantity. I am now convinced, they not only do, but that they also better the quality of this and most other sorts of bread. I think it sweet and good, very superior to any barley mixture; but if the coarseness should be objected to, two or three pounds may be taken out of a bushel, by a coarse sieve or scarch made with horse-hair. I have sent a loaf by this mail to Sir JOHN SINCLAIR.

I have the Honour to be, &c.

(Signed)

J. BISHTON.

To Sir W. PULTENEY, Bart.

TO MAKE BREAD.		lb.	COST.		s. d.
A peck of wheat with the bran	- -	17	Wheat	- - - - -	3 3
Potatoes	- - - - -	5 $\frac{1}{2}$	Grinding	- - - - -	0 1 $\frac{1}{2}$
		22 $\frac{1}{2}$	Five pounds of potatoes, at 2s. 6d.		
			per 80lbs.	- - - - -	0 2
			Baking, &c.	- - - - -	0 2 $\frac{1}{2}$
The dough before it was baked weighed	31				3 9
After baked (rather high)	24		24 lb. of bread, at 2 d. per pound, is 4s. consequently it is under 2 d. per pound.		
ANOTHER WAY.		lb.	COST.		s. d.
A peck of wheat with the bran	- -	17	Wheat	- - - - -	3 3
Dough, before it was baked	- -	26	Grinding	- - - - -	0 1 $\frac{1}{2}$
			Baking, &c.	- - - - -	0 2 $\frac{1}{2}$
After baked (rather high)	21 $\frac{1}{2}$				3 7

Twenty-one pounds and an half of bread, at 2 d. per pound, is 3s. 7 d. consequently by adding 2 d. worth of potatoes, you gain two pounds and an half of bread, which at 2 d. per pound, is 5 d. besides improving much the quality of the bread.

NUM.

NUMBER XI.

EXPERIMENTS IN BERKSHIRE, WITH VARIOUS SORTS OF BREAD.

November 10, 1795.—Four bushels of barley, nine gallons measure, which weighed 232 lbs. were ground into two bushels of flour, weighing 112 lbs. The beans weighed 116 lbs.; so there was a loss of 4 lbs. in the grinding once and dressing twice over.

The barley cost	- - - -	£. 0 19 0	Two bushels of flour, at 7s. 6d.	
The grinding	- - - -	- 0 1 0	per bushel, are worth	- - £. 0 15 0
		£. 1 0 0	The bran, or refuse of the four	
			bushels of barley, are worth	- 0 5 0
				£. 1 - 0 0

BEAN BREAD.

Half bean and half wheat-flour. *The bean-flour soaked three days*, water changed every day. The bread made the usual way, and baked the usual time. The bread turned out good.

A bushel of good beans will make a bushel of flour; four bushels of barley will produce two bushels of flour.

The brans of barley are rather more valuable than the brans of wheat; because the flour cannot be so well got out of barley brans; and these brans will serve for store-pigs and horses.

NUMBER XII.

EXPERIMENT WITH POTATOE BREAD, BY MR. JOSEPH HARRIS, OF WICKTON, NEAR LEOMINSTER, HEREFORDSHIRE, IN JUNE, 1795.

In obedience to the request of the Board of Agriculture, Mr. HARRIS sent a loaf of potatoe bread, made with his own hands, from the following quantity of Lammas seconds and potatoes:

To one bushel of flour, 56 lb. weight, value then	- - - -	£. 0 10 0
He added 33 lb. of potatoes, boiled and peeled	- - - -	0 1 0
		£. 0 11 0

The above quantity produced 100 lb. of bread, of the quality of the sample sent, which at 1d. 791. per lb. came to - £. 0 14 11

One bushel of wheat-flour alone, will produce 67 lb. of bread, at the same price, amounting to - 0 10 0

Advantage gained by 33 lb. of potatoes - 0 4 11

From which deduct their value - 0 1 0

The net saving in each bushel will be - 0 3 11

Which reduces the price of the bushel of flour to - 0 6 1 - 0 10 0

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NUMBER XIII.

EXPERIMENTS MADE BY ORDER OF SIR J. CALL, AT HIS HOUSE AT WHITEFORD, IN CORNWALL, THE BEGINNING OF DECEMBER, 1795, IN REGARD TO BREAD MADE BOTH WITH WHEAT AND BARLEY.

A Winchester bushel of wheat, weighing when put into the mill	-	59 lb.
Wasted in grinding	-	1
Produced in meal, including the flat bran	-	58
The meal being mixed with water, yeast, and salt, weighed in dough, when divided into loaves of 7 or 8 lb. before it was put into the oven	-	88
When the loaves were drawn out of the oven thoroughly well baked, and left two hours to cool, they weighed	-	74½

The bread thus made, was excellent, and fit for any household use, and had the broad bran been taken out (about 5 lb.), the Winchester bushel of wheat, thus manufactured, would have produced 16¼ quartern loaves.

A Winchester bushel of barley, weighing when put into the mill	-	52½ lb.
Wasted in grinding and dressing	-	2
The bran of barley being taken out, as unfit for the composition of bread, weighed	-	6
The meal weighed	-	44
Which being mixed with water, yeast, and salt, when divided into loaves of 7 or 8 lb. before it was put into the oven, weighed	-	72
When the loaves were drawn out of the oven, thoroughly well baked, and left two hours to cool, they weighed	-	60

This barley bread was also very good, and is such as is eaten by many of the farmers in Devon and Cornwall, by most of the labourers in husbandry, and by almost all the miners, even when wheat is much more plenty, and not above half the price it is at present.

NUMBER XIV.

PLAN OF A PREDATORY MILL, FOR GRINDING CORN BY HORSES, INVENTED BY MR. WALKER, LECTURER IN NATURAL PHILOSOPHY. WITH AN ENGRAVING.

Parochial Mills have long been ardently wished for, as the best expedient for supplying the poor with cheap and wholesome bread. Fortunately Mr. WALKER, so well known for his lectures on natural philosophy, has directed his attention to this important subject, and has invented a mill, which may either answer the purpose itself, or may be improved upon by others conversant in the principles of machinery.

Mr.

Mr. WALKER gives the following account of what he calls the Predatory Mill:—
 “ This mill was invented by me, as a means of grinding corn on the march of a regiment ; but the irregularity of roads would certainly obstruct the operation of the mill-stones ; hence, though I had the commission from Woolwich, I never sent the model, as that objection seemed to me insurmountable. But I conceive it capable of becoming a village-mill, as nothing but a circular path, of about 12 or 15 yards diameter, tolerably smooth, would answer every purpose of a fulcrum to a stationary mill, and require no greater draught. One horse I conceive capable of working this mill for four or five hours at a time, with stones of 3 feet 6 inches diameter, and to travel two miles and an half in grinding three bushels of wheat. It is capable of travelling from house to house, or from town to town ; people may have their own grain ground by it in their own yards, and by their own horses ; and any injury likely to accrue to the stones, by travelling from place to place, may easily be prevented, by wooden wedges temporarily put in between them.

“ This drawing is a skeleton of the mill, without cover, or ark to receive the flour : (A) is the upper-stone, adapted by its concave inner surface to the convex surface of the under-stone, as usual ; (B) is the trundle, and (C) the cog-wheel. This cog-wheel is fixed on the axle of the wheel (D), and is about a foot less in diameter than (D), that it may not touch the ground in travelling. The wheel (D) is fixed on the axle (E) ; but the wheel (F) is loose upon it, as in ordinary carriages : (G) is a bolting-sieve, turning round by the cog-wheel, and open under the eye of the mill : (O O) the shafts to yoke the horse in. When the mill travels from place to place without grinding, a loose rung is taken out of the trundle (B), so the stones lie still.

“ A. W.”

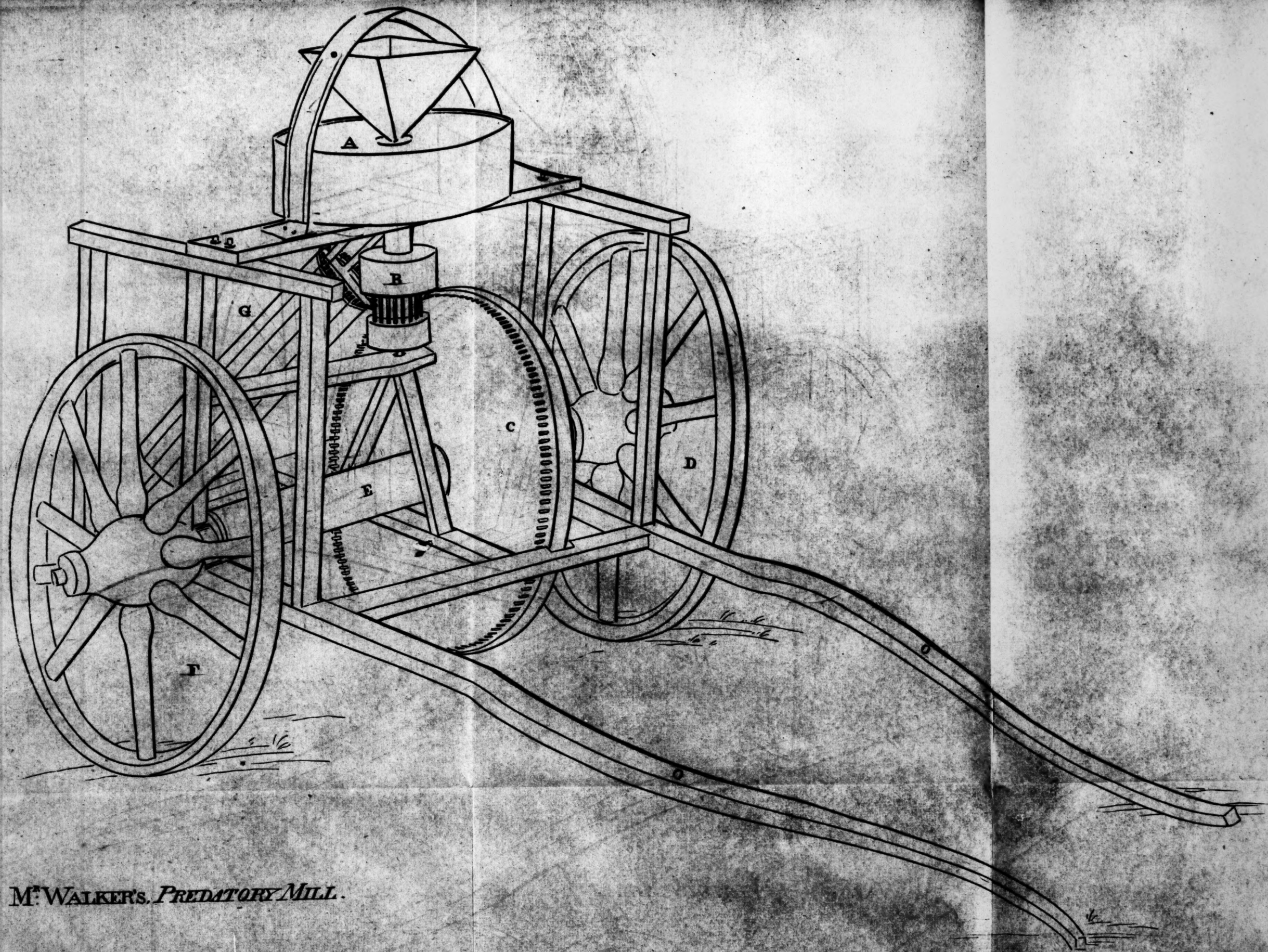
N. B. The wheels (DF) may be about 6 feet 4 inches in diameter ; the other proportions follow from these ; only I think the machine ought to be made 2 or 3 feet wider and longer than a common cart.

NUMBER XV.

METHOD OF MAKING POTATOE BREAD IN FRANCE, AS DESCRIBED BY L'ABBE DE BORY.

THE following method I have seen practised, and have practised myself, in France, in 1789.

1. The potatoes to be well washed and cleaned.
2. Boil them in clear water. This may be done in about twenty minutes, after the water begins to boil. They are then taken out, and peeled.
3. Preserve carefully the water in which the potatoes were boiled, as it contains the astringent acidity, which gives solidity to the potatoe when it goes to the oven. This water serves to give substance to the bread, and to knead the flour to the potatoe.
4. Add



M. WALKER'S PREDATORY MILL.

4. Add ten pounds of potatoes, well crumbled, to ten pounds of flour, knead them together with the water above-mentioned, in the common way.

5. I have seen very fine, and good bread, with fifteen pounds of potatoes and ten pounds of flour: it keeps better than bread-made entirely of wheat flour; it remains fresh, and does not dry up, like a wheaten loaf. I have ate such, a month old, still very good: it has a whiter colour than the wheaten loaf.

The London bakers find the making of it too troublesome, and will not make it: such as do, sell it as dear as the other, though this may be afforded for ten-pence when the other costs fourteen-pence.

NUMBER XVI.

ON MIXED BREAD.

ADDITIONAL INFORMATION FROM THE PARISH OF HIGHWORTH.

SIR,

I had the honour of receiving your letter of the 7th inst. and should have sent you the account of what you required before, but waited to see if any improvement could be made in baking. Respecting what bakers' profit should be, it is out of my power to say; I can only state what each loaf costs this parish, all expences added to the flour, which is as follows: four bushels of barley-flour, of fifty-six pounds each, at seven shillings and four-pence per bushel, and four bushels of wheat-flour, of what is called seconds, at fourteen shillings per bushel, together with five shillings expence for barn, salt, firing and making, will cost a baker sixteen-pence per loaf, the said eight bushels of flour producing, on an average, sixty-eight loaves and a half: the dough is weighed nine pounds three-quarters to each loaf; when hot from the oven, it weighs nine pounds, and when cold, eight pounds three-quarters. You may be assured of this important truth, that the said eight bushels of flour, will make full as much weight of bread, as if made of all wheat-flour.

From experience here, we find the barley should be ground by the French stones only, which produces flour of a brighter colour, and preserves what the bakers call the life of the flour, and thereby raises the bread in the oven, to the greatest height it can be brought to. The oven must be much hotter than for all wheat bread, and the bread should stand, as ours, two hours and three-quarters, in the oven, before drawn.

You must know, I am no baker, but I overlook the whole of the business, and make weekly for the poor of this parish, which is very large, from eight hundred to nine hundred, and sometimes eleven hundred large loaves. Gentlemen from many parts of the country, come to see the bread, and inquire the mode of making it; and the Monday before last, the Rev. Mr. WATTS, a Magistrate of Uffington, near Faringdon, Berks, came and examined the bread, which he much approved of; since which, he has advertised in the Oxford, and other papers, the mode adopted by the parish of Highworth, stating every particular, and recommending it to become general.

Respecting

Respecting the offal, or barley *meal*, which is what it should be called, I sell it at seven shillings per hundred weight, of one hundred and twelve pounds, which is applied to fattening hogs, as also for fattening oxen, for which it is very profitable. Eighteen gallons of barley, weighing one hundred and twenty pounds, will produce fifty-six pounds of very good flour, and sixty pounds of barley meal, which meal sells for three shillings and six-pence. As to pea, bean, or Indian corn flour, from inquiry, the very small quantity that can be used with wheat mixed, will bear the smallest proportion, when tried, to barley-flour; and when unexceptionable nutritive bread can be made of half wheat and half barley, bakers should make no other sort of bread.

As the last crop of barley is so much superior to that of almost any former year, now is the time to use it to the best advantage. I should think it right for the Board to get some bread made according to their direction, and make it public, as no time should be lost in so important a business. The bread of nine pounds out of the oven, sold in the parish at one shilling per loaf, gives the greatest satisfaction. We have found here, that barley-flour will not bear the fermentation as wheat-flour will, so that the sponge must be made of wheat-flour altogether, and the barley added when the dough is going to be made.

If any thing I have said, should be of use, I shall be glad to hear of it, and hope you will excuse my freedom, as it arises from experimental knowledge.

I am, SIR,

Your most obedient humble Servant,

Highworth,
December 25, 1795.

WM. CHAMBERLEN.

To Sir JOHN SINCLAIR, Bart.
President of the Board of
Agriculture.



THE END.